

Appln. No. 10/733,738
Amendment dated May 15, 2006
Reply to Office Action dated November 16, 2005

Remarks/Arguments

The foregoing amendments and these remarks are in response to the Office Action, dated November 16, 2005. At the time of the Office Action, claims 2 and 4-18 were pending in the application.

Claims 2 and 4-18 were rejected under 35 U.S.C. § 103. Specifically, claims 2 and 6 were rejected under 35 U.S.C. § 103(a) as being unpatentable over U.S. Patent No. 4,735,656 ("Schaefer"). Claims 4, 5, 7-15 and 18 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Schaeffer in view of U.S. Patent No. 6,190,124 ("Freling"). Claims 4, 5, 7-15 and 18 were further rejected under 35 U.S.C. § 103(a) as being unpatentable over Schaeffer in view of U.S. Patent No. 6,896,485 ("Ohara"). Each of the obviousness rejections of the independent claims and, where appropriate, the dependent claims will be addressed in turn below.

Claim 2

While acknowledging that "Schaefer does not specifically teach the amounts of ceramic particles to be added," the Office Action takes the position that it would have been obvious to one having ordinary skill in the art at the time the invention was made to use amounts of SiN and cBN that provide the desired abrasiveness to the coating.

It is respectfully submitted that the invention recited in claim 2 is not obvious in light of Schaefer. There are several things that Schaefer does not disclose. First, while noting that the abrasive material 22 can include a mix several listed ceramic materials, Schaefer does not specifically call out the claimed combination of cubic boron nitride and silicon nitride. Second, Schaefer is devoid of any discussion of the relative amounts of such materials.

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It would not have been obvious to vary the amounts of cubic boron nitride and silicon nitride to achieve a substantially 50:50 mixture, as recited in claim 2. The Office Action notes that "SiN and cBN have known values of hardness; therefore one of ordinary skill would have found it obvious to vary the amounts to achieve the desired abrasive quality in the coating." The Office Action's focus on the hardness quality of cBN and SiN reveals the flaw of the obviousness rejection.

It is desirable to use cubic boron nitride in abrasive materials because of its proven cutting capability. With the goal of maintaining such cutting capability in mind, one skilled in the art would actually be motivated away from decreasing the relative amount of cubic boron nitride in the abrasive material for fear of a dramatic reduction in cutting ability. Applicant has gone against this conventional thinking by decreasing the relative amount of cubic boron nitride by about half and substituting it with silicon nitride. As noted in the present application, such a mixture was surprising because the initial cutting capability of the mixture was shown to be comparable with a blade tip with 100% cBN. Thus, in going from 100% cBN to a substantially 50:50 mixture of cBN and Si_3N_4 , the initial cutting capability of a blade was not substantially sacrificed.

Moreover, achieving a desired hardness is not the only goal of the invention recited in claim 2. In addition, the invention recited in claim 2 seeks to provide greater resistance to thermal degradation in the turbine engine environment. As noted in the instant patent application, a coating with relatively equal amounts of the cubic boron nitride and the silicon nitride has surprisingly proved to effectively retain the benefits of each material system - superior cutting properties of the cubic boron nitride and greater resistance to thermal

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degradation of the silicon nitride. Schaefer clearly does not appreciate such considerations. Indeed, there is no discussion whatsoever is Schaefer regarding preventing thermal degradation, while maintaining the cutting capability of cubic boron nitride. It is only with the benefit of hindsight that one skilled in the art can modify the disclosure of Schaefer to arrive at the preferred mixture. Thus, the disclosure of Schaefer does not render claim 2 obvious.

In responding to Applicant's previous arguments, the Office Action points to the specification current application to note that relative amounts of the abrasives can be varied to suit the specific engine application, "which seems to imply that one of ordinary skill would be able to adjust the amount of abrasives based on the desired function." While it may be possible to adjust the relative amounts of cBN and SiN; however, the language of the claim cannot be disregarded. Claim 2 specifically recites a substantially 50:50 mixture. Though it notes that other mixtures can be suitable, the present application cannot be used against the patentability of the pending claims and cannot be used as a basis for modifying Schaefer.

In light of the above, it is respectfully submitted that claim 2 is not obvious in view of Schaefer and that the rejection of claim 2 has been overcome. As a result, a discussion of the rejection of claim 6, which depends from claim 2, is moot.

Claims 4 and 5

According to the Office Action, claim 4 is obvious based on Schaefer, which discloses all of the elements of claim 4, except that it does not teach the additional composition of MCrAlY. The Office Action relies on Freling and Ohara to supply these deficiencies.

It is respectfully submitted that it is only with the benefit of hindsight of the present invention that one skilled in the art would arrive at the claimed combination of cubic boron

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nitride, silicon nitride and CoNiCrAlY. Notably, none of the references disclose this particular combination. Nor is any motivation provided by any of the references to use such a mixture in the abrasive coating. Therefore, the invention recited in claim 4 would not be obvious to one skilled in the art.

Further, claim 5 recites that the mixture includes substantially equal parts of cubic boron nitride and silicon nitride. For at least the reasons set forth in connection with claim 1, Schaefer does not disclose such relative amounts of cubic boron nitride and silicon nitride nor are such amounts obvious. Neither Freling nor Ohara discloses these relative amounts.

In light of the above, it is respectfully submitted that claims 4 and 5 are not obvious based on Schaefer in view of Freling or Ohara and that the rejections have been overcome. Thus, a discussion of the rejection of claim 18, which depends from claim 4, is moot.

Claim 7

According to the Office Action, Schaefer teaches all elements of claim 7, except for the "additional compositions of MC_xAlY or specifies the ring segment with which the tip comes into contact." The Office Action relies on Freling and Ohara to supply the deficiencies. Claim 7 has been amended to recite that the abrasive coating includes a mixture of substantially equal parts of cubic boron nitride and silicon nitride. Therefore, for at least the reasons set forth in connection with claims 1 and 5 above, the proposed combination of Schaefer with Freling or Ohara would not be obvious to one of ordinary skill in the art.

Because claim 7 is distinguishable over Schaefer, Freling and Ohara, all claims depending therefrom are necessarily distinguishable over the cited references.

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Conclusion

In light of the foregoing, it is respectfully submitted that the rejections set forth in the Office Action have been overcome. Accordingly, Applicant respectfully requests that the Examiner reconsider the claims currently pending in the application; withdraw the rejections under 35 U.S.C. § 103; allow all of the pending claims; and promptly issue a timely Notice of Allowance.

Respectfully submitted,

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